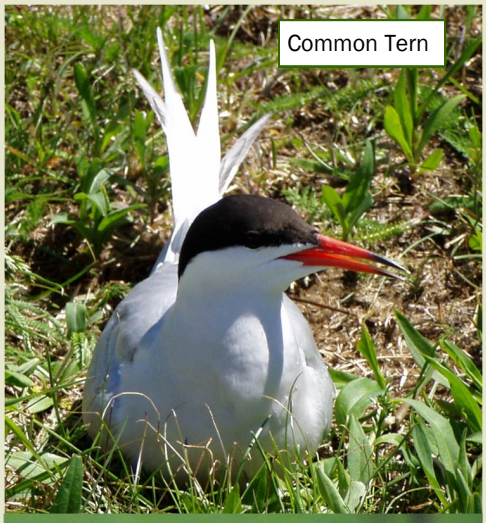
U.S. Fish and Wildlife Service

Seabird Restoration & Research Efforts in Maine: 2013

Maine Coastal Islands National Wildlife Refuge



Common Tern

Arctic Tern

Need for Restoration:

Arctic, common, and roseate tern populations were decimated in the Gulf of Maine in the late 1800's due to a combination of shooting and egging for use as food and bait. Thousands of terns were also harvested to provide feathers for the growing millinery trade. When these activities were halted in the early 1900's, tern populations increased to at least 14,775 pairs in 1931 (including Machias Seal Island). Unfortunately for the terns, gulls also benefited from federal protection, and their numbers increased rapidly along the coast. The prevalence of open landfills allowed Herring and Great Black-backed Gulls to produce a greater number of chicks. These chicks also experienced greater survival rates due to the year-round abundance of food. Both species are effective predators of tern eggs and young, and their presence can lead to complete nesting failure or island abandonment by many species of seabirds. Gulls also initiate nesting earlier in the season than terns, which forces terns to nest in marginal habitat. As a result, terns may be more vulnerable to increased predation, inclement weather, and flooding from storms. We estimate that the Gulf of Maine gull population was 10,000 pairs in the early 1900's. By the late 1970's that number had increased to 100,000 pairs. The combination of expanding gull populations and habitat loss resulted in a continuous decline in the tern population for the next 50 years. We estimate the Gulf of Maine tern population was 5,320 pairs in 1977. Since 1977, an implemented management plan developed by the Gulf of Maine Seabird Working Group (GOMSWG) has worked to reverse this decline.

How do we restore a seabird colony?

The first task in re-establishing a colony was to make it safe for terns to nest on their former breeding islands. In some cases, it was sufficient to maintain a human presence on the island to discourage nesting gulls. In other cases, small populations of gulls have been controlled through egg and nest destruction, pyrotechnics, and limited shooting. Larger gull populations were removed with avicide DRC 1339. Avicide allowed managers to remove the breeding population of gulls in a relatively short period of time. Continued gull harassment and nest destruction prevents any additional gulls from settling on the island. If the terns had recently abandoned the site, they may quickly return to the island once the gulls are removed. In situations where terns had not nested in decades, it was necessary to actively attract birds to the islands using social attraction equipment. Managers use sound systems to continuously play the sounds of a tern colony. Tern decoys are scattered throughout the area. Social attraction has been shown to be highly effective in re-establishing seabird colonies on several islands within the Gulf of Maine. Laughing gull, common eider, Leach's storm-petrel, Atlantic puffin, razorbill, and black guillemot also colonized the islands once the gulls were removed.

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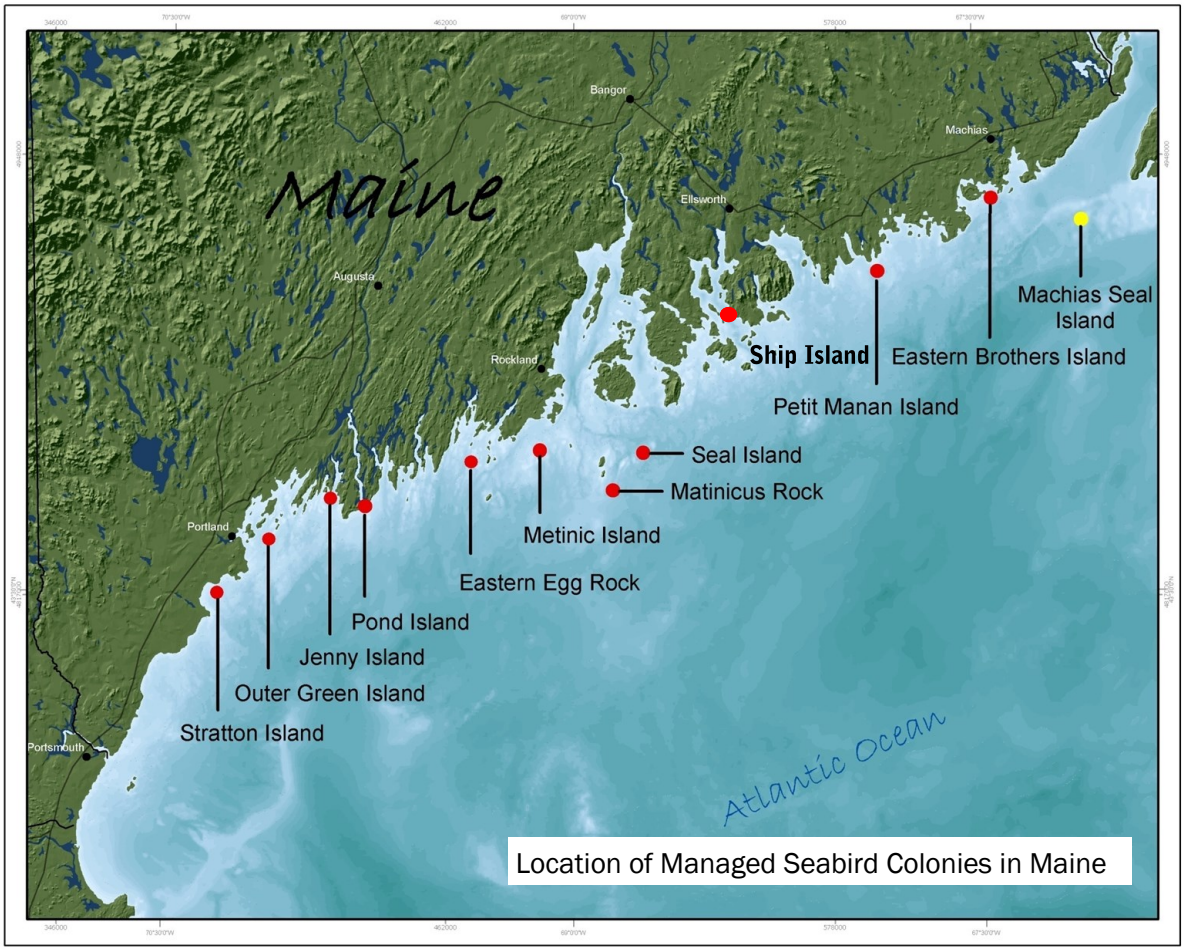


Location of Managed Seabird Colonies in Maine

Results of 2013 Seabird Surveys in Maine

Island	Common Tern	Arctic Tern	Roseate Tern	Atlantic Puffin	Razorbill	Laughing Gull
Eastern Brothers	0	0	0	0	0	0
Petit Manan	817	616	2	47	2	750
Ship Island	436	0	0	0	0	0
Metinic(north end)	209	142	0	0	0	0
Seal	1,448	1,039	0	715	21	0
Eastern Egg Rock	831	68	83	86	0	1,848
Matinicus Rock	171	519	0	355+	390+	579
Pond	692	0	0	0	0	0
Jenny	946	0	7	0	0	0
Stratton	1,284	3	93	0	0	0
Outer Green	1,143	0	0	0	0	0
All other islands	97	0	0	2-4	No census	0
2013 TOTAL	8,074	2,387	185	1,200+	650+	3,177
2012 TOTAL	8,141	2,467	136	1,250+	600+	3,433

Razorbills nest on 6 islands in Maine, but only three sites are actively managed. We do not survey the colonies on the unmanaged islands on a regular basis.

Eastern Brothers

Eastern Brothers Island is a 17 acre island located approximately three miles south of Machiasport. The Refuge initiated a seabird restoration effort on the island in 2007. Atlantic puffin and razorbill decoys were placed along the 80' tall cliffs on the south side of the island. We added puffin and razorbill vocalizations to the social attraction effort in 2012. To attract terns that had been observed foraging in the region, tern decoys and a sound system were also placed on the island. Although razorbills and Atlantic puffins have been observed adjacent to the island, and a few have come ashore to interact with the decoys, none have nested on Eastern Brothers. Common terns have successfully raised a chick in 2007 and 2010. During other years, one tern has been consistently observed interacting with decoys and sometime actively discouraging other terns from utilizing the island. In 2012, our resident tern returned to the island and was visited throughout the season by small numbers of terns. We found one egg in the "decoy colony" but it was never incubated. During the past seven years, we have trapped 9 adult mink on the island, and in 2010 we also removed 5 young mink. Trapping efforts have focused on removing the mink prior to the seabird nesting season. Unfortunately, we believe that predators continue to influence the success of the project. The island supports several hundred pairs of black guillemots.


Razorbill


Atlantic Puffin

Petit Manan Island (PMI)

Petit Manan is a 16 acre island located approximately three miles south of Petit Manan Point in Steuben. This island was historically one of the most important colonial seabird nesting islands in the Gulf of Maine. The Service acquired this historic lighthouse station from the US Coast Guard (USCG) in 1974. Significant numbers of terns had nested on PMI, including 1,500 pairs observed in 1971. When the light station was automated in 1972, USCG staff no longer needed to live on the island. After the people left the island, the numbers of nesting gulls gradually increased. By 1983 terns no longer nested on PMI, but were attempting to nest on various other islands within the region. The Service initiated gull control in 1984, and within one week the terns returned to Petit Manan. We believe the rapid success of this project was due to the return of Arctic and common terns that had temporarily been displaced from Petit Manan due to the presence of nesting gulls.

Petit Manan (Continued)

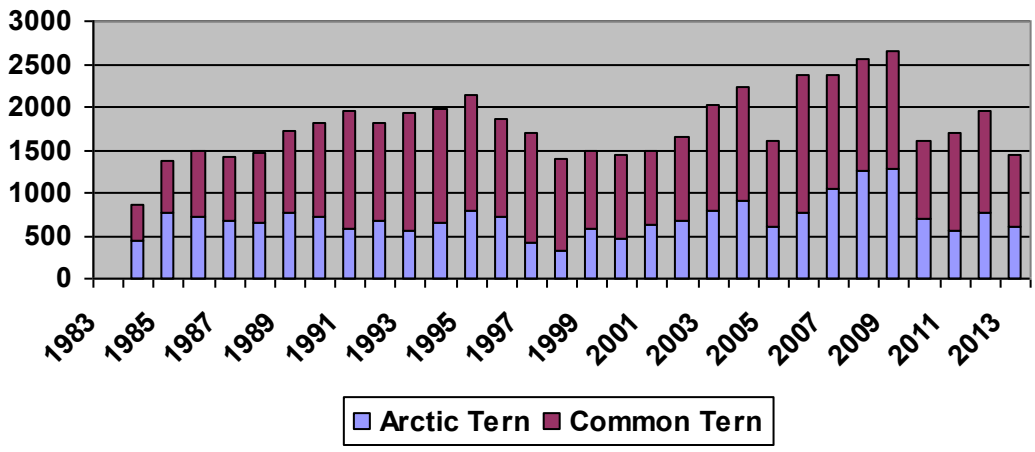
In 2013 the island supported 817 pairs of common terns, 616 pairs of Arctic terns, two pairs of endangered roseate terns, and 750 pairs of laughing gulls. The number of roseate and Arctic terns nesting on PMI and throughout the Gulf of Maine has declined significantly in recent years, The cause of this decline is unknown. Productivity rates for common and Arctic terns were very low in 2013. We believe this was a combination of cold temperatures and heavy rains when the tern chicks were very young. Great black-backed gulls also predated the colony at a higher rate then we typically observe. The Refuge is currently studying the effects of prescribed fire and mowing on the islands' vegetation.

In 2009, the island supported a record high of 104 pairs of puffins. Unfortunately the puffin colony has declined in recent years, and in 2013, the island only supported 47 pairs of puffins. We believe puffins burrows have been destroyed by storms and we have been constructing artificial burrows for the puffins. Many colonies also reported a decline in puffin and razorbill numbers in 2013, after large numbers of birds were found dead along the eastern seaboard over the 2012-13 winter. This season we had a high count of 135 puffins, 25 razorbills, and 296 black guillemots visiting Petit Manan Island. Two pairs of razorbills nested, and each produced a chick. Leach's storm-petrels, black guillemots, and common eiders also nest on PMI.

Seabirds Nesting on Petit Manan: 2009-2013

Year	Common Tern	Arctic Tern	Roseate Tern	Atlantic Puffin	Laughing Gull
2009	1,374	1,268	4	104	1,171
2010	912	688	1	88	270
2011	1,138	558	0	67	845
2012	1,186	758	2	67	811
2013	817	616	2	47	750

Arctic and Common Tern Recovery at Petit Manan Island: 1983-2013



Research Highlight:

NanoTagging Terns on Petit Manan Island

Project Objectives:

- Use automated receiving stations and coded radio tags (nanotags) to track the movements of terns nesting on Petit Manan Island
- Determine colony attendance patterns for terns nesting on Petit Manan (how often do they forage, how long do the foraging trips last, do foraging patterns change once their eggs hatch?)
- Determine direction of foraging flights, and if possible, the location of foraging habitat

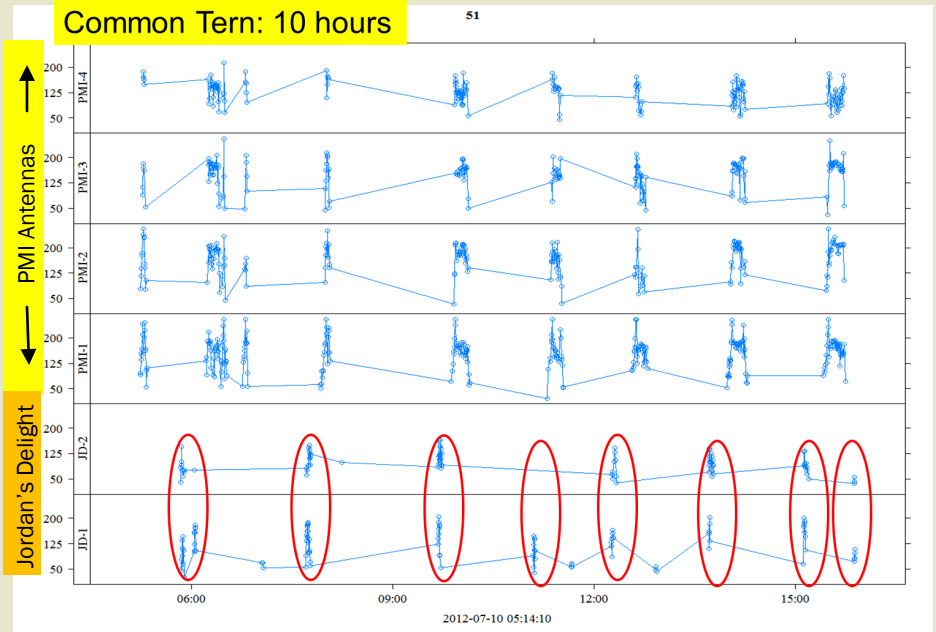
Methods:

- Attach 1.6 gm nanotags to the back of incubating terns
- Establish 4 automated receiving stations to track the movement of the birds (Petit Manan Island, Nash Island, Jordan's Delight, and Petit Manan Point)
- Receiving stations deployed by our conservation partners from Cape Cod MA to Nova Scotia will allow us to track the terns on migration

Results:

- Common Terns: average forage flight lasted 83 minutes, they spent 9.5 hours/ day on foraging trips, and they potentially traveled 43 km from the island on those trips
- Arctic Terns: average forage flight lasted 138 minutes, they spent 14 hours / day on foraging trips, and they may have traveled 80 km from the island on those trips

Receiving station with 2 antennas on Jordan's Delight Island



Example data from receiving station: Data indicates Common Tern made 8 round trip flights between Petit Manan Island and Jordan's Delight (9 km to the NE) in a 10 hour period. Each panel of the graph indicates the signal strength of the radio tag and that signal can indicate which direction the bird was flying

Ship Island

Ship is an 11 acre island within Blue Hill Bay, located 2.5 miles from Tremont. Historically Ship Island supported over 300 common tern nests, while an additional 500 pairs nested on the adjacent Trumpet Island. In 1993, a tern restoration project was initiated. For the first time in more than 50 years, a pair of terns nested on Ship Island in 1995. The colony continued to grow and in 1999, 558 pairs of common terns nested on ship Island. In 2000, for unknown reasons, several pairs initiated egg laying, but all nests were abandoned early in the season. In 2001, the Refuge set up social attraction equipment in an effort to draw the terns back to the site. The attraction equipment worked and we counted 267 common tern nests. Shortly after the census a mink swam out to the island and caused wide-scale colony abandonment. Only four tern chicks fledged from Ship Island in 2001. The Refuge set numerous traps throughout the nesting season, but we were unable to trap the predator. Prior to the 2002, 2003, and 2004 nesting seasons, the Refuge set numerous mammal traps on Ship Island to try and make the island "predator free" before the terns arrived. Initial response by the terns looked promising, and approximately 120 terns were routinely visiting the island in 2002 and 2003. Unfortunately, none of these birds were successful in raising chicks. The Refuge decided to terminate the Ship Island project in 2005, however terns continued to nest on the island in small numbers.

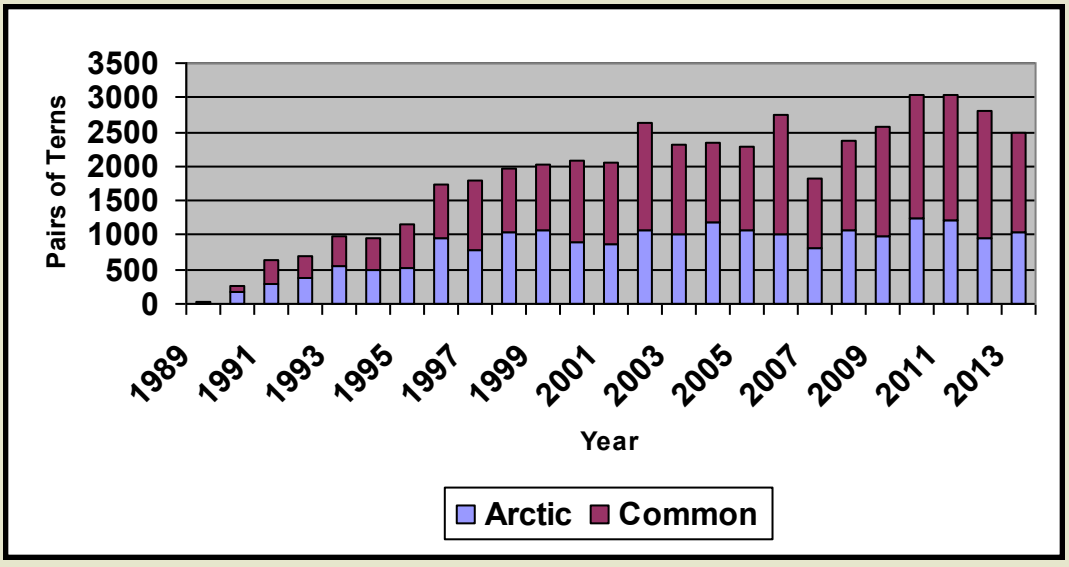
Common Tern

After a thorough review of recent survey data for the coast of Maine, the Refuge decided to return to Ship Island in 2010. We believed that we had gained sufficient skills to address the predation issues. In addition, terns continued to nest throughout the Blue Hill Bay system and we believed that they deserved a chance to nest on an island where predators are controlled. In 2010 we recorded 41 common terns nests on Ship Island during the tern census in June, and the colony increased to 436 pairs in 2013. Productivity remains very good at Ship Island. While mink have not been a problem in recent years, we have removed two great horned owls.

Seal Island NWR

Seal Island NWR is a 65 acre rocky island located just six miles east of Matinicus Rock, in outer Penobscot Bay. Seal Island was once the largest Atlantic puffin colony in the Gulf of Maine. For over 200 years it was also a summer campsite for fishermen harvesting herring, groundfish, and lobster. The fishermen also used their nets to harvest the nesting seabirds, which led to the demise of the colony by 1887. The island was eventually re-colonized by cormorants, gulls, and terns. By 1953 the growing gull population had completely displaced all nesting terns. The US Navy used the island as a bombing target from the 1940's – 1960's. The Service acquired the island in 1972, and began a seabird restoration effort in 1984. After six years of gull control and social attraction, 20 pairs of Arctic and common terns nested on Seal Island in 1989. Between 1984 - 1989, National Audubon Society translocated 950 puffin chicks from Newfoundland to Seal Island. Puffins first successfully bred on Seal Island in 1992. During 2007, excessive gull predation in late May resulted in a significant decline in the Seal Island tern colony. Approximately 1,000 pairs of terns relocated to nearby Matinicus Rock. The predatory gulls were removed from the island, and Seal Island was able to support 823 pairs of Arctic terns and 1,005 pairs of common terns. In 2013, the island supported 1,039 pairs of Arctic terns and 1,448 pairs of common terns. At least 715 pairs of puffins nested on Seal Island this season. Razorbills have recently started to nest on Seal Island, and this season we documented 21 pairs. The island continues to be cooperatively managed by National Audubon Society and the Service.

Arctic and Common Tern Recovery at Seal Island: 1989-2013



Seabirds Nesting on Seal Island: 2009-2013

Year	Common Tern	Arctic Tern	Roseate Tern	Razorbill	Atlantic Puffin
2009	1,581	991	0	14	425
2010	1,788	1,238	2	19	500+
2011	1,836	1,201	0	13	No census
2012	1,837	959	1	15	737
2013	1,448	1,039	0	21	715

Matinicus Rock

Matinicus Rock is a 27 acre island located 24 miles south of Owls Head. The island was owned by the USCG for over 155 years, and is the site of the historic Matinicus Rock Light Station. In the early 1900's, National Audubon Society placed wardens on the island to protect the nesting seabirds. As a result, Matinicus Rock was the only puffin colony (2 pairs) within Maine to survive the hunting that decimated most seabird colonies. Since 1900, Matinicus Rock has been a principal breeding site for Arctic terns on the Maine coast. In 1901, there were approximately 500 pairs of terns, and the population increased to approximately 3,000 pairs by 1931. In 1990, 1,252 pairs of Arctic terns nested on Matinicus Rock. This decline was likely the result of terns moving to the newly established colony on Seal Island NWR. The USCG transferred the island to the U.S. Fish and Wildlife Service in 1999. In 2013, Matinicus Rock supported 171 pairs of common terns and 519 pairs of Arctic terns. The island also supported 579 pairs of laughing gulls. We estimate a minimum of 390 razorbill and 355 puffin burrows. In 2009, common murres nested on the island for the first time since 1883, but unfortunately the egg was predated by gulls. This also represented the first time murres had attempted to nest in Maine for over 100 years. No murre eggs were located this season. Matinicus Rock also supports the only known active breeding location of manx shearwater in the United Stated. This was the fifth year that shearwaters bred on the Island, and the research crew located one chick in a burrow. Matinicus Rock continues to be cooperatively managed by National Audubon Society and the Service.

Seabirds Nesting on Matinicus Rock: 2009-2013

Year	Common Tern	Arctic Tern	Razorbill	Atlantic Puffin	Laughing Gull
2009	359	1,278	389	350+	1,161
2010	253	674	390+	350+	958
2011	258	859	No count		778
2012	286	693	390+	355+	557
2013	171	519	390+	355+	579

Research Highlight:

Satellite Tagging Razorbills

Project Objectives:

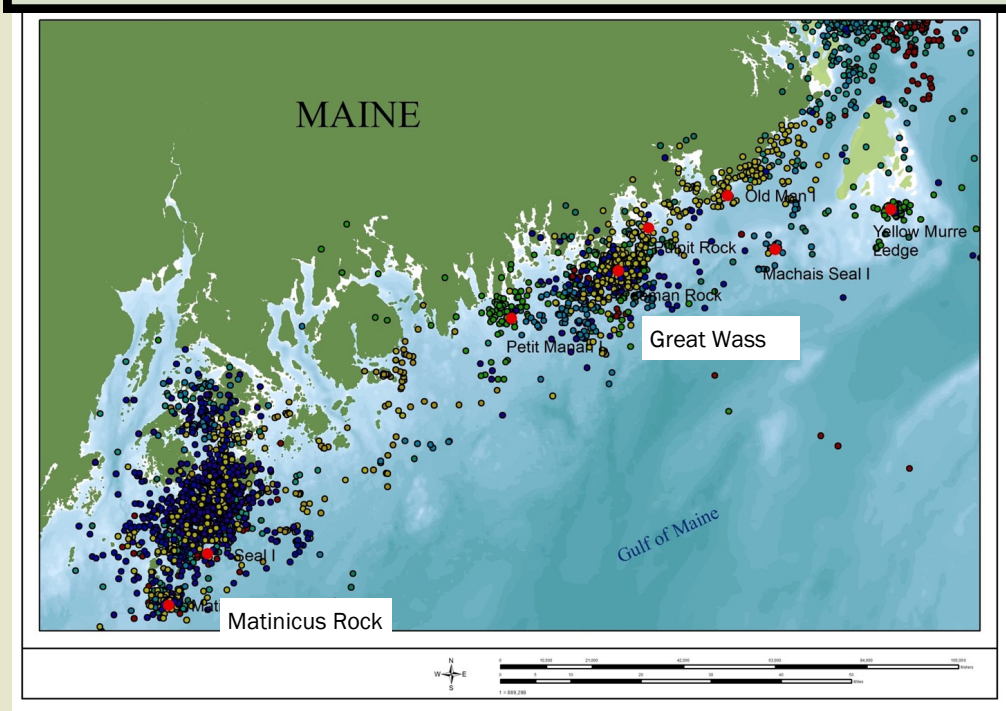
- Determine where razorbills breeding on Matinicus Rock travel to find food, how often they made those foraging trips, and what habitat conditions were associated with the foraging areas
- Determine where adult razorbills take young chicks once they leave the breeding colony (chicks are flightless for several weeks after departing the breeding colony)
- Determine fall and winter migration patterns of razorbills

Methods:

- MCINWR staff attached 16 gm solar satellite tags to the backs of 10 razorbills. We tagged 9 razorbills on Matinicus Rock, and all of these birds had young chicks. We tagged 1 razorbill at Petit Manan.
- MCINWR staff were able to track the daily movement patterns of the razorbills, as they fed their chicks and then departed the breeding colonies in late summer

Results:

- We were able to successfully attach the satellite tags to the razorbills, and the tags transmitted an average of 65 days. We had hoped the tags would continue transmitting for 12 months, and have not been able to determine the cause of the premature failure.
- Razorbills breeding on Matinicus Rock generally traveled northeast during their foraging trips, often flying 20-25 miles each way.
- All the tagged birds spent time southwest of Great Wass Island, possibly identifying a molting location for the species. MCINWR will investigate this area in 2014. The birds then moved northeast into the lower Bay of Fundy.



Adult razorbill with solar satellite tag , Matinicus Rock

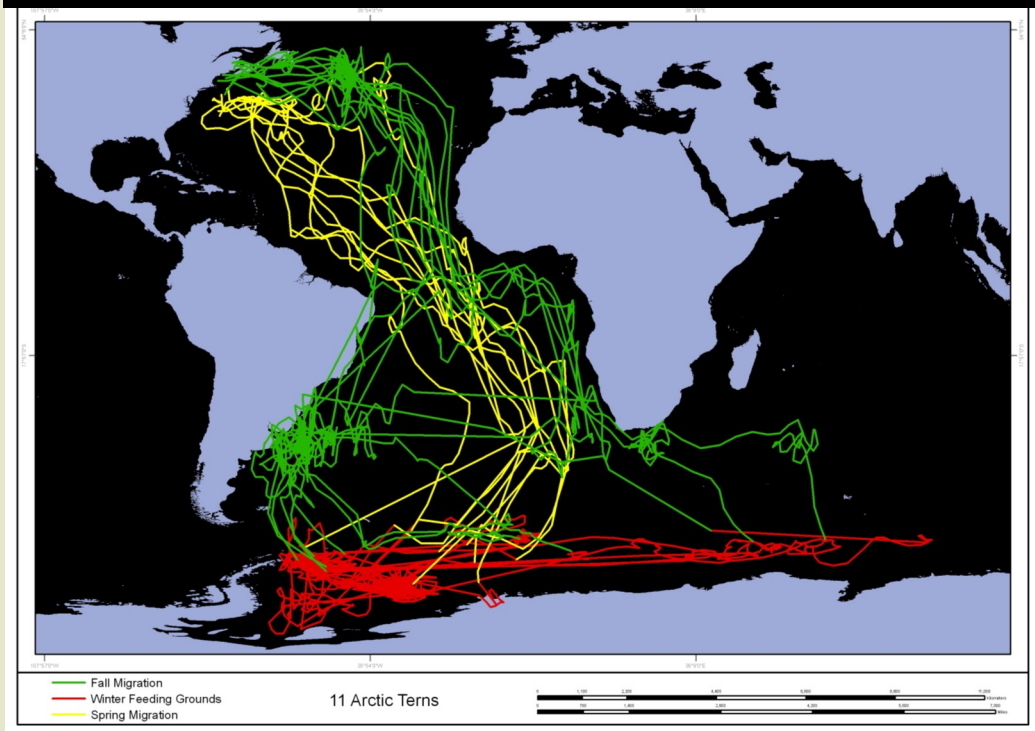
Metinic Island

The Service acquired 149 acres of the 330 acre Metinic Island in 1994 and 1995. The island is located 12 miles southeast of Rockland. Sheep have grazed the island for generations, and the 120 sheep that remain on the island are seasonally excluded from the tern nesting area. When the Service acquired the island, a small number of terns nested on Metinic, however the presence of nesting gulls limited the productivity of the colony. In 1998, the Service initiated a tern restoration project on the north end of the island. The Service placed tern decoys and a sound system, which played the sounds of an active tern colony in an effort to attract additional terns to Metinic Island. Although terns landed among the decoys, no terns nested within the restoration area. In 1999, one pair of common terns and two pairs of Arctic terns nested adjacent to the decoy area. Later in the season, nine additional pairs of terns nested near the decoys. By 2004, the colony had grown to over 700 pairs of terns. In 2011, Metinic supported 300 pairs of common terns and 198 pairs of Arctic terns. In 2012, a combination of a severe storm, gull predation, and gull control efforts (i.e. extensive shooting) combined to cause the abandonment of the Metinic tern colony. The colony returned in 2013 and 209 pairs of common terns and 142 pairs of Arctic terns nested on Metinic. The island is managed by the Service.

Tern Nesting on Metinic Island: 2009-2013

Year	Common Tern	Arctic Tern	Roseate Tern
2009	387	393	0
2010	406	352	1
2011	300	198	0
2012	0	0	0
2013	209	142	0

Research Highlight: Tracking Arctic Tern Migration



Tracking Tern Migration:

In 2010, MCINWR and National Audubon Society deployed geo-locators on Arctic terns to track their migration. The units determine where the terns are based on the length of daylight and the time of sunrise and sunset. We had to recapture the terns in 2011 to retrieve the data. The average distance travelled was 59,400 km during the year. We are hoping this data will provide managers with information on the threats Arctic terns may be facing during their migration period.

Research Highlight:

GPS Tagging Herring Gulls on Metinic Island

Project Objectives:

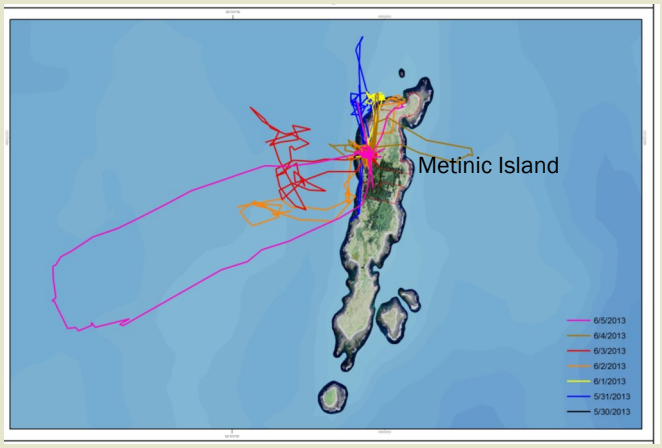
- Determine where Herring Gulls breeding on Metinic Island are foraging. Are they foraging in the intertidal region, following fishing boats, or spending time in the tern colony?
- Test efficacy of using inexpensive GPS tags ($50/tag) to track seabirds in Maine

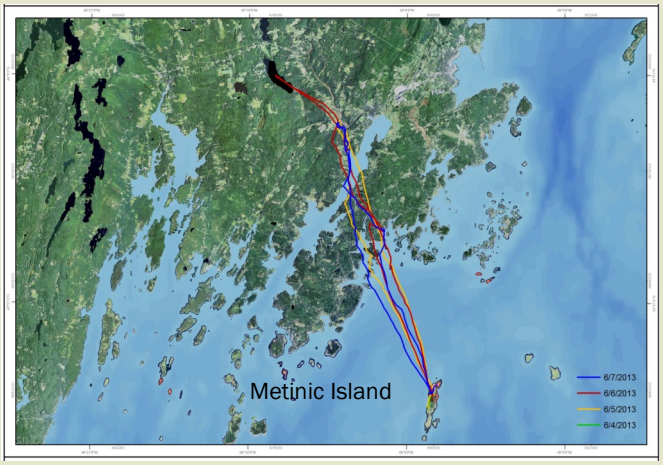
Methods:

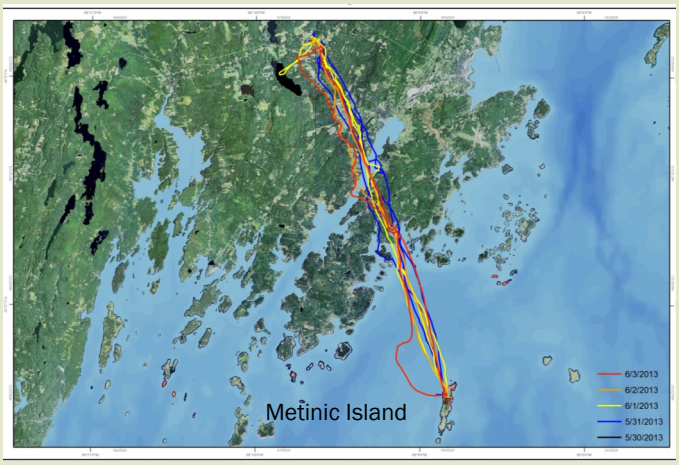
- We trapped Herring Gulls as they were incubating their eggs
- MCINWR staff attached the tags to the gulls feathers using Gorilla Tape
- The tags could record the birds' location for 120 hours, and then would need to be recovered for us to access the data

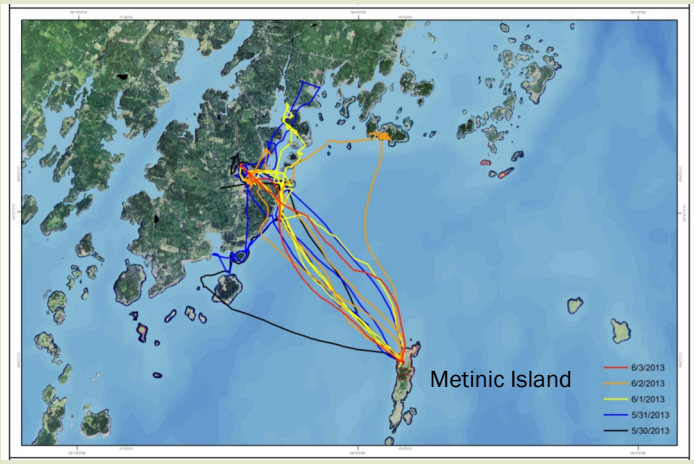
Results:

- We were able to recover 4 GPS tags on gulls. Some tags were lost when the gulls pulled the tape off their feathers
- The inexpensive tags provided accurate information on the gulls' foraging trips
- Three gulls made repeated flights to the mainland (minimum of 7 miles each way). One gull traveled up to 15 miles to forage at a dam on a river. We believe the birds were fishing for alewives.
- The forth gull foraged in the intertidal area of Metinic Island, and potentially followed fishing boats near the Island.









Pond Island NWR

The U.S. Fish and Wildlife Service acquired Pond Island from the USCG in 1973. The 10 acre island is located in the mouth of the Kennebec River, and until 1937 supported a common tern colony. Roseate and common terns nested on the nearby North and South Sugarloaf Islands until 1987. At one point in time, North Sugarloaf was the largest roseate colony in Maine. Nesting gulls had displaced terns on all three islands prior to the restoration efforts that began in 1996. One pair of common terns nested in 1996, and five pairs nested in 1997. Unfortunately, none of these nesting attempts produced any chicks. In 1998, when the one pair of terns nesting on Pond failed to hatch their eggs, NAS transplanted two common tern chicks from the nearby Jenny Island. The chicks were immediately cared for by the adults, and later fledged from the island. In 1999, 10 pairs of common terns nested and for the first time in more than 60 years, raised chicks on Pond Island. The colony has continued to grow over the past 15 years, and in 2013 Pond Island supported 692 pairs of common terns. Unfortunately the island continues to experience ongoing great horned owl predation. Pond Island is cooperatively managed by National Audubon Society and the Service.

Tern Nesting on Pond Island: 2009-2013

Year	Common Tern	Arctic Tern	Roseate Tern
2009	438	4	0
2010	590	3	3
2011	586	0	2
2012	596	0	0
2013	692	0	0

Machias Seal Island (MSI)

Machias Seal Island lies along the Maine and New Brunswick border and is the largest puffin and razorbill colony in the Gulf of Maine. In 2004, they documented 2,158 Arctic and 1,006 common tern nests, at least 3,500 pairs of Atlantic puffin, 560 pairs of razorbills, and 136 pairs of common eider. Unfortunately a combination of adverse weather events and a lack of herring to feed the chicks resulted in total nesting failure in 2005. No terns nested on the island in 2007 or 2008. In late 2009, thousands of terns arrived on the island and demonstrated courtship behavior. In 2011, the researchers estimated that 600 pairs of terns tried to nest on MSI. Unfortunately a combination of peregrine falcon and gull predation resulted in complete abandonment of the tern colony in late June. Only 90 pairs of terns attempted to nest on MSI this season, and all abandoned their nests by early June. This was the 8th season without successful tern production. Alcid surveys are not conducted every year but the most recent data indicates: 1,740 pairs of razorbills (2012), 6,563 pairs of Atlantic puffins (2011) and 219 pairs of common murres (2013) nest on MSI. The Atlantic Cooperative Wildlife Ecology Research Network has been conducting seabird research on MSI since 1995. Numerous graduate projects have been conducted on the island, including projects which have focused on survey methodology for razorbills, use of seabirds as indicators of commercial fisheries of herring, time activity budgets for terns, and an Arctic tern metapopulation study. Several commercial tourboat operators visit the island and bring a limited number of tourists ashore. The ownership of the island is disputed between the United States and Canada. According to Canada, Canadian Wildlife Service owns the island. According to the United States, Maine Department of Inland Fisheries and Wildlife (MDIFW) owns the island. The Service has a Memorandum of Understanding with MDIFW to manage the island.

Eastern Egg Rock

Eastern Egg Rock in Muscongus Bay was the first island in Maine to have an active tern restoration program. Common and Arctic terns had been displaced by gulls by 1937, but restoration activities lead to re-colonization of the island in 1980. The tern colony increased to 597 pairs in 1983, but declined to just 54 pairs between 1984-1986 due to a combination of avian cholera, restoration of the Petit Manan tern colony, and black-crowned night heron predation. Since 1986, the colony has dramatically increased, and in 2013 the island supported 831 pairs of common terns, 68 pairs of Arctic terns, 83 pairs of roseate terns, and 86 pairs of puffins. Eastern Egg Rock supports 45% of the Maine roseate tern population. In 2013, 1,848 pairs of laughing gulls nested on the island and the gulls remain a management concern for the tern colony due to direct predation on eggs and chicks. The island is owned by the Maine Bureau of Public Lands, and is cooperatively managed by National Audubon Society and Maine Department of Inland Fisheries and Wildlife.

Jenny Island

The two acre Jenny Island is located within Casco Bay, an area that once supported nesting terns on at least nine different islands. By 1990, the expansion of gulls in the Bay reduced the population to 124 pairs of common terns, nesting on three islands. Gull control and increased human presence on Jenny Island were implemented in 1991. The tern colony at Jenny Island had increased from 45 pairs in 1990 to 1,050 pairs in 2000. In 2013, 946 pairs of common terns and seven pairs of roseate tern nested on the island. The island is owned by the Maine Bureau of Public Lands, and is cooperatively managed by National Audubon Society and MDIFW.

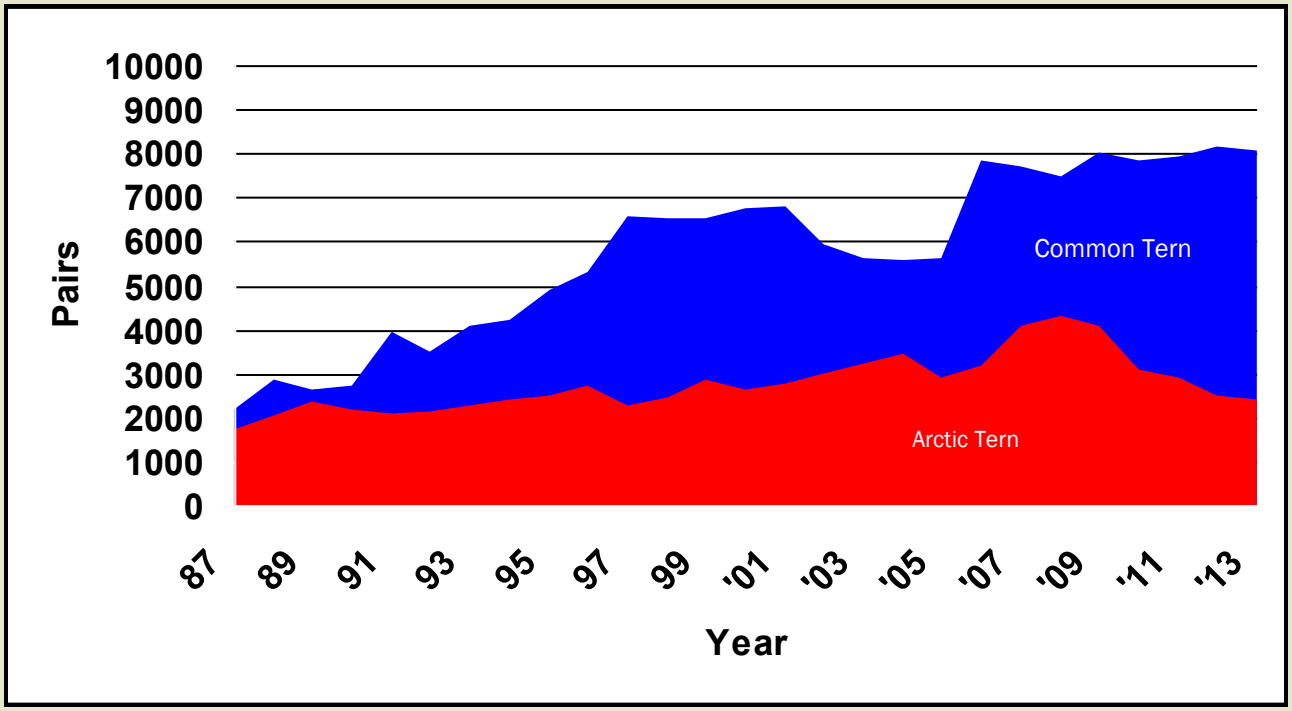
Stratton Island

Stratton Island is a 35 acre island located in Saco Bay, approximately 1.5 miles off Prouts Neck, in Cape Elizabeth. The island supported 1,500 terns in 1937, unfortunately gulls continued to displace the terns until the entire tern colony was extirpated in 1986. The tern restoration project was initiated in 1987, and succeeded in restoring five pairs of common terns. The colony continued to grow, until chronic predation by black-crowned night heron completely eliminated all productivity and reduced nesting numbers for numerous years. Managers applied aversive taste repellents on the tern chick's leg bands, but that did not halt the predation. The heron was shot in 1994. The colony has responded to the lack of heron predation, and in 2002 supported 1,375 pairs of terns. Unfortunately, a mink arrived on the island early in the 2003 season and tern numbers dropped to 305 common, four Arctic, and 40 pairs of roseate terns. In 2013, the island supported 1,284 pairs of common terns, three pairs of Arctic terns, and 93 pairs of roseate terns. Stratton Island is the largest roseate tern colony in Maine, and the island supports 50% of the state population of roseates. Least terns recently began nesting on Stratton Island, and in 2013 the island supported 92 nesting pairs. This represents 41% of the Maine least tern population. The island is owned and managed by National Audubon Society.

Outer Green Island

In 2002, the National Audubon Society initiated a new seabird restoration effort in outer Casco Bay on Outer Green Island. The island is 4.5 miles from the mainland, and it was thought the island would provide a nesting site free from mainland based predators. During the first season, one pair of common terns nested in June, but another 10 nests were established later in the season. In 2003, the island supported 94 pairs of common terns. In 2004, the colony benefited from predator disturbance on several of the other islands in the region and the colony grew to 510 pairs of common terns and eight pairs of roseate terns. In 2005, a mink swam to the island in mid July and killed more than 350 terns (mostly chicks). The mink was trapped in early August. The colony recovered from the disturbance in 2006, and the National Audubon Society documented 732 common tern and six roseate tern nests. In 2013, the colony supported 1,143 pairs of common terns. Outer Green Island is owned by MDIFW and the project is managed by National Audubon Society and MDIFW.

Common and Arctic Tern Recovery in Maine: 1987-2013

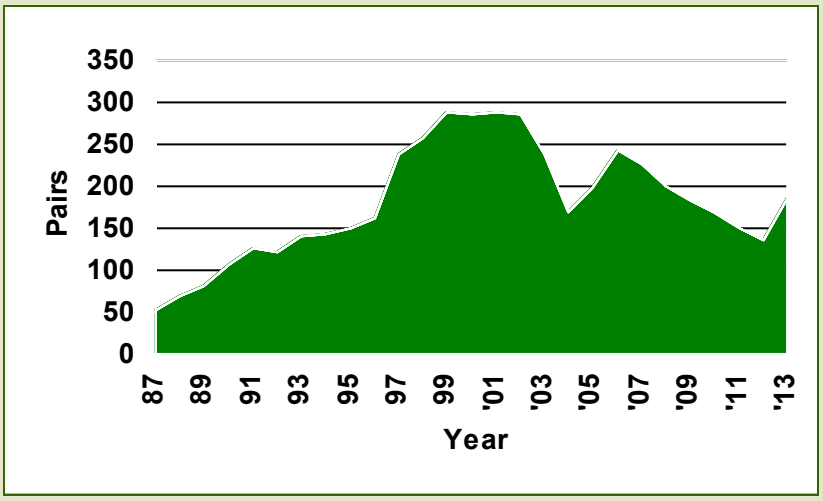


Facts about Seabirds in Maine:

- Within Maine 99% of common and Arctic terns and all roseate terns, laughing gulls and Atlantic puffins nest on 11 managed colonies
- MCINWR supports 47% of common terns and 97% of the Arctic terns nesting in Maine. With the exception of 2 pairs of Arctic terns in NH, Maine supports all of the Arctic terns breeding in the lower 48 states,.
- Within the US, 93% of Atlantic puffins nest on 3 MCINWR islands. The Refuge also supports over 85% of the razorbills breeding in the US.
- Within Maine, 95% of endangered roseate terns nest on two islands

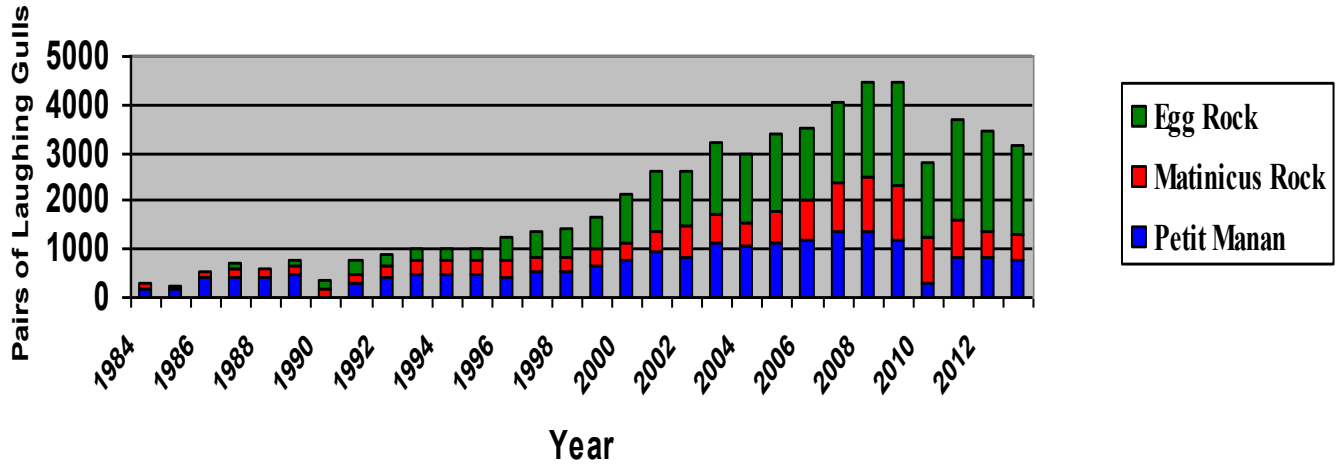

Roseate Tern

Pairs of Roseate Terns Nesting in Maine: 1987-2013



The entire northeast population of roseate terns has decreased by 29% since 2000. Managers do not know the reason for the decline, but are trying to learn about where the terns spend the winter (Brazil and Argentina) and any potential threats they may face during migration.

Pairs of Laughing Gulls Nesting on Petit Manan, Matinicus Rock, and Eastern Egg Rock : 1984-2013



In Maine, laughing gulls only nest on 3-4 islands where seabird managers prohibit the larger great black-backed and herring gulls from nesting. Laughing gulls prey on tern eggs and chicks, and complete with the terns for nesting habitat. Laughing gulls will also steal food from the terns, particularly in years when preferred food (herring and hake) appear to be scarce. To enhance tern productivity and decrease competition for nesting habitat, USFWS and NAS began a Laughing Gull control effort in 2008

Current Estimate of Seabirds Breeding in Maine

Species	# Breeding Pairs	# Colonies
Roseate Terns	185	4
Arctic Terns	2,387	6
Common Terns	8,074	13
Atlantic Puffin	1,200+	5
Laughing Gull	3,177	3
Razorbill	600+	6
Great Cormorant	72	5
Double Crested Cormorant	9,778	81
Herring Gull	24,855	180
Great Black-Backed Gull	9,536	183
Common Eider	29,000	320
Black Guillemot	12,000 adults	166
Leach's Storm Petrel	10,370	33

Species in shaded boxes are not surveyed every year, and the data represents the most recent survey information.

Research Needs at MCINWR:

- Foraging Ecology of Terns, Puffins, and Razorbills
- Influence of Climate Change and Commercial Harvest on availability of Forage Species
- Reason for Recent Decline in Arctic and Roseate Terns
- How other species of concern such as shorebirds, songbirds, raptors and bats are utilizing the Maine coast during migration
- Population Control Measures for Laughing Gulls
- Winter Distribution of Puffins and Razorbills
- Potential Conflicts with Offshore Wind Development